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PATENT AND TRADEMARK OFFICEATTORNEY'S DOCKET NUMBER  
67190/984046TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

09/646089

INTERNATIONAL APPLICATION NO.  
PCT/DE99/00815INTERNATIONAL FILING DATE  
(12.03.99)  
12 March 1999PRIORITY DATES CLAIMED  
(13.03.98)  
13 March 1998TITLE OF INVENTION  
ELECTRONIC TRIPPING DEVICE COMPRISING CONTROL AND DISPLAY ELEMENTSAPPLICANT(S) FOR DO/EO/US  
BOUJRA, Pamela; KRAUSS, Andreas; MUSIOL, Aron-Ernst; JANKOWAIK, Michael; ETTE, Bernd and TIETZ, Gerhard

Applicant(s) herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1.  This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
  2.  This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
  3.  This express request to begin national examination procedures (35 U.S.C. 371(f)) immediately rather than delay applicable time limit set in 35 U.S.C. examination until the expiration of the 371(b) and PCT Articles 22 and 39(1).
  4.  A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date
  5.  A copy of the International Application as filed (35 U.S.C. 371(c)(2))
    - a.  is transmitted herewith (required only if not transmitted by the International Bureau)
    - b.  has been transmitted by the International Bureau
    - c.  is not required, as the application was filed in the United States Receiving Office (RO/US)
  6.  A translation of the International Application into English (35 U.S.C. 371(c)(2))
  7.  Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
    - a.  are transmitted herewith (required only if not transmitted by the International Bureau).
    - b.  have been transmitted by the International Bureau
    - c.  have not been made; however, the time limit for making such amendments has NOT expired.
    - d.  have not been made and will not be made
  8.  A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3))
  9.  An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) (**UNSIGNED**).
  10.  A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5))
- Items 11. to 16. below concern **other document(s) or information included**:
11.  An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
  12.  An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
  13.  A **FIRST** preliminary amendment.
    - A **SECOND** or **SUBSEQUENT** preliminary amendment.
  14.  A substitute specification.
  15.  A change of power of attorney and/or address letter.
  16.  Other items or information: copy of Preliminary Examination Report and Search Report.

Express Mail No.

EL594607365US

U.S. APPLICATION NO. <b>09/646089</b>		INTERNATIONAL APPLICATION NO PCT/DE99/00815	ATTORNEY'S DOCKET NUMBER 67190/984046										
17. <input checked="" type="checkbox"/> The following fees are submitted:		CALCULATIONS   PTO USE ONLY											
<p>Basic National Fee (37 CFR 1.492(a)(1)-(5)):</p> <table> <tr><td>Search Report has been prepared by the EPO or JPO .....</td><td>\$840.00</td></tr> <tr><td>International preliminary examination fee paid to USPTO (37 CFR 1.482) .....</td><td>\$670.00</td></tr> <tr><td>No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) .....</td><td>\$760.00</td></tr> <tr><td>Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO .....</td><td>\$970.00</td></tr> <tr><td>International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) .....</td><td>\$96.00</td></tr> </table>				Search Report has been prepared by the EPO or JPO .....	\$840.00	International preliminary examination fee paid to USPTO (37 CFR 1.482) .....	\$670.00	No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) .....	\$760.00	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO .....	\$970.00	International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) .....	\$96.00
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<b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>		\$ 840											
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).		\$											
Claims	Number Filed	Number Extra	Rate										
Total Claims	9 - 20 =	0	X \$18.00 \$ 0										
Independent Claims	1 - 3 =	0	X \$78.00 \$ 0										
Multiple dependent claim(s) (if applicable)		+ \$260.00	\$										
<b>TOTAL OF ABOVE CALCULATIONS =</b>		\$ 840											
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).		\$											
<b>SUBTOTAL =</b>		\$ 840											
Processing fee of \$130.00 for furnishing the English translation later the <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).		\$											
<b>TOTAL NATIONAL FEE =</b>		\$ 840											
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property		+ \$											
<b>TOTAL FEES ENCLOSED =</b>		\$ 840											
		Amount to be: refunded \$											
		charged \$											
<p>a. <input type="checkbox"/> A check in the amount of \$ _____ to cover the above fees is enclosed.</p> <p>b. <input checked="" type="checkbox"/> Please charge my Deposit Account No. <u>11-0600</u> in the amount of <u>\$840.00</u> to cover the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to <u>11-0600</u>. A duplicate copy of this sheet is enclosed.</p>													
<p><b>NOTE:</b> Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a)) must be filed and granted to restore the application to pending status.</p> <p>Deposit Account No. or (b))</p> <p>SEND ALL CORRESPONDENCE TO.</p> <p><i>R. L. Mayer, Reg. No. 22,490</i> <i>Kenyon &amp; Kenyon</i> <i>One Broadway</i> <i>New York, New York 10004</i></p> <p><b>SIGNATURE</b></p> <p>Richard L. Mayer, Reg. No. 22,490 NAME DATE 13 Sept 2000</p>													

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s) : Pamela BOUJRA et al.  
Serial No. : 09/646,089  
Filed : March 12, 1999  
For : ELECTRONIC TRIPPING DEVICE COMPRISING  
CONTROL AND DISPLAY ELEMENTS  
Examiner : To Be Assigned  
Art Unit : To Be Assigned

Assistant Commissioner  
for Patents  
Washington, D.C. 20231

PRELIMINARY AMENDMENT

SIR:

Kindly amend the above-identified application before  
examination, as set forth below.

IN THE TITLE:

Please replace the title with the following new title:  
--ELECTRONIC TRIPPING DEVICE COMPRISING CONTROL AND DISPLAY  
ELEMENTS--.

IN THE SPECIFICATION:

Please amend the specification as follows:

On page 1, before line 1, insert:  
--FIELD OF THE INVENTION--.

On page 1, before 10, insert:  
--BACKGROUND INFORMATION

EL594610347US

An overcurrent tripping device of the above-mentioned type is described in, for example, U.S. Patent No. 5,051,861--.

On page 1, line 19, change "both, it must" to --both tripping devices,--.

On page 1, delete line 20.

On page 1, line 21, after "emitted" insert --must be adjustable by a user via suitable adjusting elements--.

On page 1, line 23, change "the analog tripping devices known heretofore, as a rule," to --conventional analog tripping devices,--.

On page 1, line 26, after "device" insert --, as described in, for example, U.S. Patent No. 5,051,861--.

On page 1, line 30, change "operating shaft" to --switching threshold--.

On page 2, line 16, change "known" to --conventional--.

On page 2, line 20, after "Patent" insert --No.--.

On page 2, line 37, after "close" insert --to the tripping device--.

On page 3, line 10, change "indeed known per se from U.S. Patent" to --described in U.S. Patent No.--.

On page 3, before line 28, insert:  
--SUMMARY--.

On page 3, line 28, change "This results in the object of the present invention" to --An object of the present invention is--.

On page 5, line 10, change "already" to --described--.

On page 5, line 11, delete "explained".

On page 6, line 2, change "are preferably" to --may be, for example,--.

On page 6, line 14, after "the" insert --present--.

On page 6, delete lines 17-19.

On page 6, before line 21, insert:  
--BRIEF DESCRIPTION OF THE DRAWINGS--.

On page 6, before line 34, insert:  
--DETAILED DESCRIPTION--.

On page 7, line 36, after "the" insert --present--.

On page 8, line 29, change "already explained" to --described--.

On page 11, delete line 1, and insert:  
--What Is Claimed Is:--.

**IN THE ABSTRACT:**

Please amend the abstract as follows:

Line 3, change "The present invention relates to the" to --An--.

Line 6, after "breaker" insert --is provided--.

Line 7, delete "16)", "(2 through 9a)" and "(14 through".

Line 9, delete "9a)".

Line 10, delete "(14)".

Line 11, delete "through 16)".

Line 12, delete "(2 through 9a)" and "(2 through".

Line 13, delete "9a)" and "Preferably".

Line 14, change "used are LCD elements" to --LCD elements may be used--.

IN THE CLAIMS:

Please cancel, without prejudice, claims 1-9 in the underlying PCT application.

Please also cancel, without prejudice, claims 1-4 in the annex to the International Preliminary Examination Report.

Please add the following new claims:

10. (New) An electronic tripping device for low-voltage circuit-breakers, comprising:

adjusting devices for tripping parameters, the tripping parameters including tripping current in case of overload and corresponding delay time; and

adjusting elements and display elements cooperating with the adjusting devices and mounted at an operating face of the tripping device, the adjusting elements being key switches, and the display elements being LCD

elements for displaying adjustments selected via the key switches.

11. (New) The electronic tripping device according to claim 10, wherein the LCD elements includes an LCD element for each of the tripping parameters to be adjusted, and wherein only one key set composed of three keys is provided as the adjusting elements for all LCD elements together.

12. (New) The electronic tripping device according to claim 10, wherein a first key switch of the key switches selects a desired entry field, a second key switch of the key switches provides calibrations, and a third key switch of the key switches activates display fields in an absence of auxiliary power.

13. (New) The electronic tripping device according to claim 10, wherein the display elements are bar displays.

14. (New) The electronic tripping device according to claim 10, wherein the display elements are numeric displays.

15. (New) The electronic tripping device according to claim 13, wherein a scale is arranged next to the bar displays.

16. (New) The electronic tripping device according to claim 15, wherein the bar displays move along the scale as a narrow line according to a value to be displayed.

17. (New) The electronic tripping device according to claim 15, wherein the bar displays have differing heights according to a parameter value to be displayed, an upper end of the bar indication a value to be adjusted at the scale.

18. (New) The electronic tripping device according to claim 10, wherein the LCD elements permanently present information to

be displayed without supply of energy, subsequent to feeding the information to the LCD elements.

REMARKS

This Preliminary Amendment cancels, without prejudice, claims 1-9 in the underlying PCT application PCT/DE99/00815. This Preliminary Amendment further cancels, without prejudice, claims 1-4 in the annex to the International Preliminary Examination Report, and adds new claims 10-18. The new claims, inter alia, conform the claims to U.S. Patent and Trademark Office rules and do not add new matter to the application.

The above amendments to the title, the specification and the abstract conform the title, the specification and the abstract to U.S. Patent and Trademark Office rules, and do not introduce new matter into the application.

The underlying PCT application includes an International Preliminary Examination Report ("IPER"), dated August 7, 2000. An English translation of the IPER and the annex thereto is included herewith.

It is respectfully submitted that the subject matter of the present application is new, non-obvious, and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully submitted,

Dated: 2/21/01

By: R. L. Mayer  
Richard L. Mayer  
Reg. No. 22,490

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ELECTRONIC TRIPPING DEVICE COMPRISING CONTROL AND DISPLAY ELEMENTS

The present invention relates to an electronic tripping device, in particular for low-voltage circuit-breakers, having adjusting and display elements for the tripping parameters to be adjusted, such as for the tripping current in the case of 5 overload and for the corresponding delay time, the switching and display elements cooperating with adjusting devices for the parameters, and the adjusting and display elements being mounted at an operating face of the tripping device.

There are analogously and digitally operating tripping devices. The analogously operating tripping devices simulate a tripping value, for example, a tripping current, generally using resistors and capacitors. The digitally operating tripping devices contain a microprocessor having a permanently input program and work in cycles, i.e., they check for example, the level of the current as well as the given requirements within the scope of a sequential sequence, and decide whether or not tripping should be carried out, giving a corresponding tripping command if indicated. In both, it must 20 be adjustable by a user via suitable adjusting elements whether, or rather when a tripping command is to be emitted.

In the analog tripping devices known heretofore, as a rule, the tripping parameters are adjusted with the aid of 25 potentiometers, rotary coding switches, or DIP switches which can be accessed at the operating face of the tripping device.

Used in digitally operating tripping devices are equally arranged coding switches, possibly of the same kind, which define a corresponding operating shaft by a combination of positions. All these adjusting and coding switches, which 30 generally contain mechanical contacts, are complicated, very

small elements whose reliability frequently leaves something to be desired, in particular because these switching devices, which are provided with contacts and which are extremely delicate due to their small size, can easily be impaired by  
5 dust, moisture, and vibrations frequently found in the environment of switching stations. In addition, these coding switches are operated at very low voltages and small currents. If the intention is for the mentioned deficiencies to be eliminated, considerable outlay is required, resulting in a  
10 considerable increase in price. Also, the readability is often unsatisfactory since, due to the space requirements, very small adjusting switches having correspondingly small scales are chosen.

Apart from the adjustment of tripping devices using mechanical switches of the mentioned kind, it is known to store all adjustment values in a chip card and to transfer the adjustment values by inserting the chip card into the tripping device which possesses a card reader. A design approach of that kind is shown in Fig. 1 of German Patent DE-OS 44 45 079. On the control console containing the control elements, the display, and the hand lever for charging the stored-energy spring mechanism, the tripping unit is discernible as well which has a field with which the chip card is brought into contact. The chip card contains the adjustment values for the tripping unit, and is connected thereto via contacts, as a result of which the values stored on the chip card are transferred to the tripping unit. If the chip card is not put on, the tripping device is fixed at a basic adjustment having the lowest values possible so that no dangerous condition can arise. That is, without the chip card, the switch is operated at its minimum values.

Another proposal provides for the adjustment to be carried out via a serial interface with which the tripping devices can be equipped for transferring tripping values. However, this means that it is required to go close with a notebook computer or

with another special hand-held controller, to connect or plug in this notebook or hand-held controller, and to look at the display. In the process, a checking of the storage of the adjustment in the tripping device is difficult or at least requires considerable outlay and, in fact, an extra device is required which must be connected for every adjustment, and which, in addition, is complicated and expensive.

In low-voltage circuit-breakers, LCD bar displays having a driver circuit are indeed known per se from U.S. Patent 4 429 340; in that case, however, they are used to indicate the current presently carried by the switching device, and have nothing to do with the adjustment of the tripping quantities of auxiliary releases or any adjusting operations at all. They are used for a completely different purpose, namely just as indicator, and consequently do not interact with any adjusting elements.

In general, a plurality of adjusting devices is required according to the variety of protective functions which an electronic tripping device can perform. Apart from the difficulty of arranging the adjusting devices in a manner that they are clear and easily accessible to the user, the interconnection of the adjusting devices with the electronic modules of the tripping device additionally requires a not inconsiderable outlay.

This results in the object of the present invention to provide adjusting controls for adjusting the parameters of the electronic tripping devices in which the mentioned mechanical adjusting switches are substituted by subassemblies which are technically better, less delicate, significantly simplified, consequently cost-effective, easily readable and easy to handle for the user, and which are reliable and inexpensive.

This object is achieved according to the present invention by using LCD elements in conjunction with a rugged key control in

lieu of miniaturized mechanical circuit closers having correspondingly small scales, the LCD elements serving as display elements for the respective parameters to be adjusted, and the key switches being used as adjusting elements. In this context, the adjustment of the tripping values and consequently the control of the LCD display elements is preferably carried out via only one key set composed of three keys having the following functions:

- Key 1: Selection of the desired entry field in a continuous sequence;
- Key 2: Calibration, increase of the adjustment values in predefined steps of a bar display or gradually in fine steps to stepless in the case of an alphanumeric display;
- Key 3: Activation of the display fields, supply of an auxiliary power if the tripping device is not connected to the electrical network and, therefore, an auxiliary power is required. In this case, an auxiliary power source is brought into circuit via key 3 for a short time. This can be, for example, a battery or a capacitor.

The LCD displays can be designed as bar displays or as alphanumeric displays. In the case of bar displays, a scale, which can be executed with differing fineness in uniform steps, is arranged next to the LCD display. Then, the bar of the LCD display can have a differing height, in each case according to the parameter value to be displayed, the upper end of the bar indicating, at the scale, the value to be adjusted, or the bar can move along the scale as a narrow, line-like bar according to the value to be displayed.

In alphanumeric displays, the adjusted value is displayed in a manner that it is directly readable as a number.

In this context, each of these three LCD elements is

controlled using the above-mentioned keys in the mode  
described in greater detail in the following. Using the first  
key, the desired entry field is selected in a continuous  
sequence, i.e., each time the key is pressed, the field  
following the currently selected field is selected.

Using the second key, the tripping parameter of the selected  
field is adjusted in such a manner that, each time the key is  
pressed, the adjustment value is increased in the predefined  
steps or even continuously. In this context, as already  
explained above, the grading can be stepped coarsely or finely  
in the case of a bar display, as well as finely stepped to  
stepless in an alphanumeric display. When the highest value is  
reached, the display returns to the lowest value the next time  
the key is actuated so as to increase again in response to  
further actuation. The third key for activating the display  
field is pressed only if the switch is not connected to the  
electrical network or switched off, i.e., if no voltage is  
applied to the auxiliary release. Then, in fact, an auxiliary  
supply is brought into circuit for the adjusting device.  
Otherwise, this device is always active. The auxiliary supply  
can be a battery or a capacitor which retains its charge for  
days if it is not brought onto load, and which is able to  
energize electronic loads having low current consumption of  
the order of microamperes for hours.

It is also possible to use LCD elements which, irrespectively  
of whether alphanumeric or graphic displays are used,  
permanently present the information to be displayed without  
supply of energy, subsequent to feeding the information to the  
display. This makes it possible for the power demand to be  
further reduced since the control power, which needs to be  
supplied during the adjustment of the auxiliary release in the  
zero-current state, must be provided only for a short time.  
LCD elements of that kind are offered by the Kent company.

Using the proposed display, it is possible for a plurality of

parameters to be adjusted. The adjustable parameters of the tripping device are preferably divided into four groups: inverse time-delay tripping, instantaneous tripping, short-time-delay tripping, and time-delay ground-fault tripping. In  
5 this context, the adjustment is based on a percentage of the rated current of the current transformer, the rated current, in turn, being determined by the fitting of the circuit-breaker with specific current transformers. Therefore, this rated transformer current is indicated at the operating face  
10 of the tripping device. Since at least two adjustment quantities are required for each parameter, namely threshold value and magnitude of the desired time delay, provision is made for two adjustment possibilities, respectively, according to the invention consequently two display fields, in  
15 conjunction with a shared adjusting key set.

In the following, the present invention is explained in greater detail on the basis of preferred exemplary embodiments depicted in the Figures.

Figure 1 shows a schematic representation of an operating face of an electronic tripping device according to the present invention having a bar LCD display.

Figure 2 shows a schematic representation of an operating face of an electronic tripping device according to the present invention having an alphanumeric LCD display.

Figure 3 shows another design of a bar LCD display.

Figure 4 shows a block diagram of an electronic tripping device according to the present invention.

The operating face 1 of an electronic tripping device shown in Figure 1 has eight LCD displays 2 through 9 which are designed as bar LCD displays. In this context, the bar displays are executed in such a manner that in each display, for each

parameter, a narrow bar 10 moves along a scale 11 existing in each display.

As shown in Figure 3, the bar display can also be designed in such a manner that bar 12 can in each case have a different height in LCD display 2 through 9, in accordance with the magnitude of the parameter to be adjusted and, consequently, to be displayed, top edge 13 of bar 12 then expediently indicating this value on scale 11 which is arranged next to LCD display 2 through 9.

These display types which feature a bar display are suitable for a relatively coarsely stepped adjustment. If a finer grading, which can be made finer up to stepless, continuous adjustment, is desired, it is expedient to use an alphanumeric display.

This is shown in Figure 2 in a substantially identical operating face 1 of an auxiliary release, LCD displays 2a through 9a of the operating face having an alphanumeric design.

In this case, the adjustable parameters of the tripping device are divided, for example, into four groups: long-time-delay tripping, instantaneous tripping, short-time-delay tripping, and time-delay ground-fault tripping. In this context, the adjustment is based on a percentage of the rated current of the current transformer, the rated current, in turn, being determined by the fitting of the circuit-breaker with specific current transformers. Therefore, a sign 19 indicating this rated transformer current  $I_n$  is provided on the operating face of the tripping device. Since at least two adjustment quantities are required for each parameter, namely threshold value and magnitude of the desired time delay, provision is made for two adjustment possibilities, respectively, according to the invention consequently two display fields, in conjunction with a shared adjusting key set.

- Thus, for example,  
LCD display 2a shows:  $I_r$  = percentage of the rated  
transformer current;
- LCD display 3a shows: the time delay in seconds;
- 5 LCD display 4a shows: the characteristic numeral of a  
multiple of  $I_n$  (instantaneous  
tripping);
- LCD display 5a shows: percentage of  $I_r$ ;
- LCD display 6a shows: the characteristic numeral of a  
multiple of  $I_n$  (or  $I_{np}$ ) for short-  
time-delay tripping;
- 10 LCD display 7a shows: time delay is switched off;
- LCD display 8a shows: the characteristic letter for the  
percentage of  $I_n$  in the case of a  
ground fault; and
- LCD display 9a shows: the time delay in ms.
- Each of LCD displays 2 through 9a is controlled using only  
three keys 14 through 16, independently of the type of the  
display.
- Via first key 14, the desired LCD display 2 through 9a is  
selected in a continuous sequence, i.e., each time key 14 is  
pressed, the display following the currently selected display  
is selected. Using second key 15, the tripping parameter is  
adjusted in the selected LCD display 2 through 9a in such a  
manner that, each time key 15 is pressed, the adjustment value  
is increased in the predefined steps or even continuously. In  
this context, as already explained above, the grading can be  
25 stepped coarsely or finely in the case of a bar display, as  
well as finely stepped to stepless in an alphanumeric display.  
When the highest value is reached, LCD display 2 through 9a  
returns to the lowest value the next time key 15 is actuated  
so as to increase again in response to further actuation.
- 35 Third key 16 for activating LCD displays 2 through 9a keys is  
pressed only if the switch is not connected to the electrical

network or switched off, i.e., if no voltage is applied to the auxiliary release. Then, in fact, an auxiliary supply is brought into circuit for the adjusting device. Otherwise, this device is always active. The auxiliary supply can be a battery  
5 or a capacitor which retains its charge for days if it is not brought onto load, and which is able to energize electronic loads having low current consumption of the order of microamperes for hours. It is also possible to use LCD elements which, irrespectively of whether alphanumeric or  
10 graphic displays are used, permanently present the information to be displayed without supply of energy, subsequent to feeding the information to the display. This makes it possible for the power demand to be further reduced since the control power which needs to be supplied during the adjustment of the auxiliary release in the zero-current state must be provided only for a short time. LCD elements of that kind are offered  
15 by the Kent company.

For the sake of completeness, it should also be mentioned that the combination of a rugged and insensitive key with an easily recognizable LCD element per se, as the root idea of the invention, does, of course, not enable the electronic tripping device itself to be adjusted. To this end, as schematically shown in Figure 4, a corresponding adjusting circuit 17 or the  
25 like is to be provided, which is controlled via keys 14 through 16, and to which, on one hand, LCD display 2 through 9a, which is visible to the user, is connected as output element, and from which, on the other hand, the internal signal for tripping device 18 is derived. For this purpose, a  
30 plurality of possibilities exist.

The advantages of the present invention are that rugged key switches are used in lieu of the usual miniaturized, delicate adjusting elements, and that an easily readable LCD display is provided in place of the small scales of the mentioned small adjusting elements, which are hard to recognize. LCD displays have by far the lowest current consumption and, consequently,  
35

offer the possibility of making these adjustments even while the switches are switched off, using a simple auxiliary power source which can be made available in an inexpensive manner.

Moreover, it is possible to use LCD elements which,

5 irrespectively of whether alphanumeric or graphic displays are used, permanently present the information to be displayed without supply of energy, subsequent to feeding the information to the display. This makes it possible for the power demand to be further reduced since the control power  
10 which needs to be supplied during the adjustment of the auxiliary release in the zero-current state must be provided only for a short time.

Patent Claims

1. An electronic tripping device, in particular for low-voltage circuit-breakers, having adjusting and display elements for the tripping parameters to be adjusted, such as for the tripping current in the case of overload and for the corresponding delay time, the switching and display elements cooperating with adjusting devices for the parameters, and the adjusting and display elements being mounted at an operating face of the tripping device,  
characterized in that key switches (14 through 16) and LCD elements (2 through 9a) are provided as adjusting and display elements.

2. The electronic tripping device as recited in Claim 1, characterized in that an LCD element (2 through 9a) is provided as display element for each parameter to be adjusted, and in that only one key set composed of three keys (14 through 16) is provided as adjusting element for all LCD elements (2 through 9a) together.

3. The electronic tripping device as recited in Claim 1, characterized in that, for adjusting the tripping values and, consequently, for controlling the LCD display elements (2 through 9a) via the shared key set (14 through 16), the following mode is provided:

- Key 1: Selection of the desired entry field;
- Key 2: Calibration;
- Key 3: Activation of the display fields in the absence of auxiliary power.

4. The electronic tripping device as recited in Claim 1, characterized in that the LCD displays (2 through 9a) are bar displays.

5. The electronic tripping device as recited in Claim 1, characterized in that the LCD displays (2 through 9a) are

alphanumeric displays.

6. The electronic tripping device as recited in Claim 4, characterized in that, in the case of bar displays, a scale (11) is arranged next to the LCD display (2 through 9a).
7. The electronic tripping device as recited in Claim 4, characterized in that the LCD display (2 through 9a) is designed in the form of a bar (10) which moves along the scale (11) as a narrow line according to the value to be displayed.
8. The electronic tripping device as recited in Claim 4, characterized in that the LCD display (2 through 9a) is designed in the form of a bar (12) having a differing height according to the parameter value to be displayed, the upper end of the bar indicating the value to be adjusted at the scale (11).
9. The electronic tripping device as recited in Claim 1, characterized in that LCD elements are provided which permanently present the information to be displayed without supply of energy, subsequent to feeding the information to the display.

Abstract

The present invention relates to the operating face of an electronic tripping device having adjusting and display elements for the tripping parameters to be adjusted of the auxiliary releases of a low-voltage circuit-breaker. Used as adjusting and display elements are key switches (14 through 16) and LCD elements (2 through 9a), an LCD element (2 through 9a) being provided as display element for each parameter to be adjusted, and only one key set composed of three keys (14 through 16) being provided as adjusting element for all LCD elements (2 through 9a) together. The LCD displays (2 through 9a) can be bar displays or alphanumeric displays. Preferably used are LCD elements which permanently present the information to be displayed without further supply of energy, subsequent to feeding the information to the display.

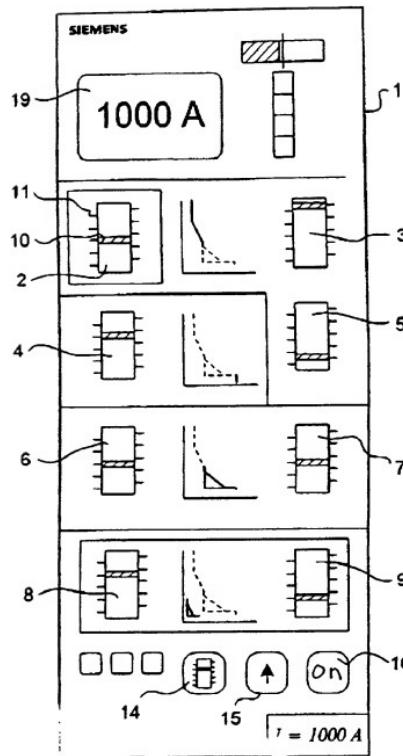


FIG 1

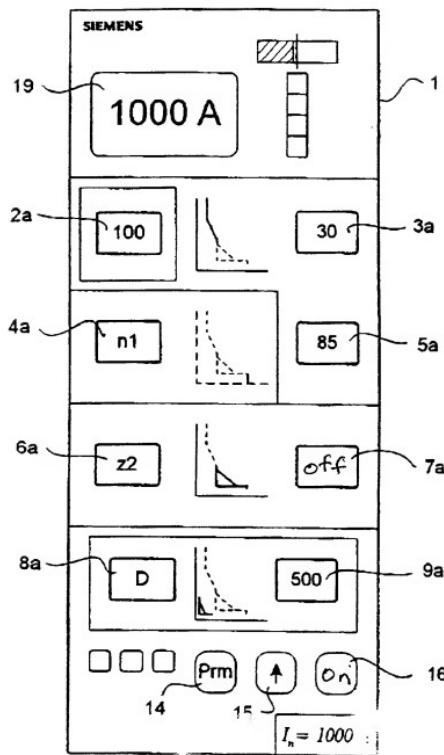


FIG 2

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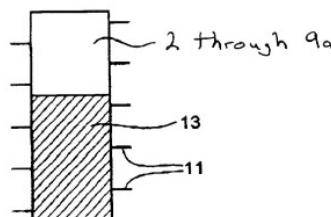


FIG 3

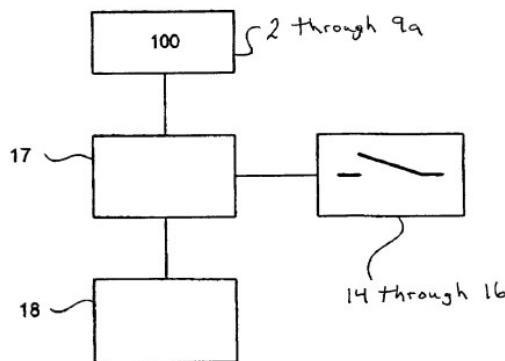


FIG 4

**DECLARATION AND POWER OF ATTORNEY**

As a below named inventor, hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled **ELECTRONIC TRIPPING DEVICE COMPRISING CONTROL AND DISPLAY ELEMENTS**, for which an application for Letters Patent was filed as PCT Application No. **PCT/DE99/00815** on **March 12, 1999** and as U.S. Application, Serial No. 09/646,089.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application(s) for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

**PRIOR FOREIGN APPLICATION(S)**

Number	Country	Day/month/year filed	Priority Claimed Under 35 USC §119
198 11 956.9	Fed. Rep. of Germany	13 March 1998	YES

EL302705084

3  
And I hereby appoint Richard L. Mayer (Reg. No. 22,490), Gerard A. Messina (Reg. No. 35,952), and Michelle M. Carniaux (Reg. No. 36,098) my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Please address all communications regarding this application to:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful and false statements may jeopardize the validity of the application or any patent issued thereon.

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